

GRANITE

IN

ARCHITECTURE

GRANITE ASSOCIATION

NATIONAL BUILDING GRANITE QUARRIES ASSOCIATION INCORPORATED

5619 Grand Central Terminal Building

TELEPHONE
MURRAY HILL 9-2465

NEW YORK

ARCHITECTURAL GRANITE

Granite's unchallenged qualities as a high grade building material have long been recognized by architects and engineers. Its strength and durability, its inherent beauty and character, and the wide range of colors and textures available, are well known facts.

Many, however, are not familiar with the latest technological developments in quarrying and processing granite, which have reduced its cost and widened its field of application in architecture and engineering.

Few building materials are as cost-sensitive to methods of detailing as granite. Up-to-date information is more important than ever before, if full advantage is to be taken of the economies and extended application made possible by improved methods and facilities. To that end the information on the following pages is offered, and architects and engineers are invited to call upon the granite manufacturer or the Association for any specific information desired.

ARCHITECTURAL AND ENGINEERING USES

The aesthetic and physical qualities of granite adapt it to widely divergent types of use in architecture and engineering. Reduced cost and faster deliveries now apply in all fields of application, and have especially stimulated the use of granite in remodeling work and light construction.

The varied uses to which building granites are specially adapted may be summarized under three major groups, each having design and specification requirements applicable to type and function of product involved:

I—STANDARD BUILDING GRANITE

For buildings of standard type construction in which the exterior material is used structurally, either self-supporting or as bonded masonry, such as:

Monumental, Institutional, Office and Commercial Buildings, Mausoleums, and similar high grade building work.

II—GRANITE VENEER

For buildings in which the exterior material is primarily a decorative or protective veneer, without having any particular structural function, such as:

Store Fronts, Remodeling Work, and Light Construction.

III—MASONRY GRANITE

For more rugged types of masonry construction in which the exterior material is an integral part of the masonry and in which massive strength and durability are primary requirements, such as:

Rock Face Building Work, Bridges, Heavy Engineering Construction, Retaining Walls and Rubble Masonry.

SPECIFICATION POINTS

TOLERANCES—Any tolerances which the architect can permit in respect to stock, color, finish, beds and joints, thickness of material, or in dimensions, all tend toward economy.

STANDARD CUT GRANITE WORK

Outline of essential points and suggested requirements as they may apply to work involved.

(1) WORK INCLUDED—Furnishing—Delivery—Setting.

All granite work shown or specified.

State portions to be of granite.

(2) MATERIAL—Granite—Sound, of good quality, free from defects which would impair strength, durability or appearance.

Equal to approved samples.

Name granites to be considered or color, tone and grain.

(3) SAMPLES—State number and size required.

Provide for samples to show extreme range in color, texture, and quality of stock and finish.

(4) SHOP DRAWINGS—Requirements as to preparation, submittal and approval.

(5) FINISHES—Name finish or finishes required on drawings and specifications.

(6) CUTTING—Specify quality of surface, arrises, beds and joints to conform with normal requirements for grade of finish specified.

Note—The kind of surface finish controls trueness and quality of arris lines.

Points to cover and suggested requirements:

(a) Surface—All exposed surfaces shall be—

(For Polished, Rubbed and Fine Hammered) Out of wind and free from apparent waves.

(For Coarse Hammered and Sawed) Approximately plane.

(For all Hammered finishes) Free from raw spots, smooth or depressed areas, with bush hammer marks uniformly distributed, approximately parallel (in direction required for bushing).

(For Pointed Finishes) Approximately plane, indented surface, with point marks reasonably uniform in depth and distribution.

(For Rock Face) Pitch lines in approximate plane. State average minimum or maximum projection required—for average work 1" projection per foot of rise.

No depressions in face below pitch plane.

Face free from drill holes.

(b) Arrises—To conform with finish of face as to trueness and sharpness.

(c) Beds and Joints—Sawed or cut full and square for at least 2" from face (1½" for joints), and may fall off not over 1" in 12" (1½" for joints), reasonably free from large depressions.

(d) Jointing—As shown on approved drawings and (see note) in thickness at arris line.

Note—Generally ¼" for polished and the finer finishes, ⅜" for coarser finishes, and from ½" to 1" or more for pointed, rock face and more rugged work.

(7) BONDING—As shown on approved drawings.

Beds on projecting courses at least equal to projection, unless otherwise shown.

(8) MOLDING—Uniform profile throughout length in conformity with full size details, flush at joints with arrises true and straight in conformity with surface finish.

(If hammered)—Bushings parallel to run of mold and square to edge for facias and flats.

(9) WASHES AND DRIPS—Cut washes on stones having exposed tops, unless otherwise shown.

Drips—cut or abrasive sawed on underside of projecting stones.

Reglets for flashing where shown or specified.

(10) MODELS—State models required—to be furnished to granite contractor.

(11) ROUGHING FOR CARVING—State requirements if carving is to be done by others than the granite contractor.

(12) CARVING—State requirements—character of work, where to be done.

Note—Unless carving is otherwise specified, it is understood to be tooled finished.

(13) HANDLING, SHIPPING AND STORAGE—The finished granite shall be protected from damage in transit, and shall be handled and stored at site in such manner as to avoid breakage, staining or other damage to the finished granite.

(14) SETTING—Shall be done by competent, experienced stone setters, and in strict accordance with the approved drawings and specifications.

All granite to be brushed clean and drenched immediately before setting, and carefully bedded in a full bed of non-staining mortar.

Facing not to be built up over two courses ahead of backing.

Facing to be kept free of mortar at all times.

Face joints to be immediately raked out to depth of 1".

Sills and similar stones subject to unequal pressure to be bedded only at ends.

Waterproof mortar for joints on level or washed surfaces exposed to weather.

Note—It means nothing to specify that granite be set on its natural bed, as the cleavage plane in some granites is at right angles and in others is parallel to the quarry beds.

(15) ANCHORING—Galvanized iron anchors, ¼" x 1¼", turned down into granite 1¼", extending 8" (if possible) and turned up 1½" into the backing.

Show or describe any special anchoring required.

(16) CLEANING AND POINTING—After all danger of stain or damage from other operations on the building has passed, the granite work shall be carefully cleaned down, removing all dirt, mortar stains and other defacements.

Prohibit use of wire brushes (liable to cause rust stains), and acids or solutions which might discolor the granite.

All face joints—brush clean, thoroughly wet and fill with pointing mortar, and strike joint as directed by the architect.

(17) DEFECTIVE WORK—No patching or hiding of defects. Defective stones to be replaced unless otherwise directed by the architect.

GRANITE VENEER

Surface Finish—Finishes best adapted for granite veneer include: Polished; Honed; Rubbed; Sawed; and Special Sand, Shot or Abrasive treatments.

Hammered or pointed finishes are not recommended for work under four inches in thickness.

Beds and Joints—Sawed or cut full and square at least two-thirds back from face, reasonably free from depressions, and may fall off at back not over one inch.

Width of Joint—For average work one-quarter inch. For close jointed

polished work 3/16" or ⅛" may be specified.

Setting—Granite veneer should be set in non-staining mortar. Backs of mortar joints should be suitably damp-proofed or parged to prevent moisture seeping through the joint from the backing.

Anchoring—For veneer over 2" thick use ⅜" round iron, galvanized after bending, turned down 1¼" for 4" veneer, or 1" for 3", using two anchors in top bed of each stone.

For 1½" to 3" veneer use ¼" round iron turned down ¾".

For veneer under 1½" thick use 1¼" x ⅛" strap anchors.

COLOR CLASSIFICATION

GRANITES QUARRIED BY ASSOCIATION MEMBERS

COLOR	GRAIN	NAME OF GRANITE	LOCATION	QUARRIED BY
WHITE				
White	Medium	Chelmsford White	West Chelmsford, Mass.	H. E. Fletcher Co.
White	Medium	Cold Spring Pearl White	Isle, Minn.	Cold Spring Granite Co.
White	Medium	Mount Airy White	Mount Airy, N. C.	North Carolina Granite Corp.
GRAY				
Very light gray	Medium	Mount Airy	Mount Airy, N. C.	North Carolina Granite Corp.
Very light gray	Fine	North Jay	North Jay, Me.	Maine & New Hampshire Granite Corp.
Light gray	Fine	Chelmsford Gray	West Chelmsford, Mass.	H. E. Fletcher Co.
Light gray	Fine, inclined to medium	Milford, N. H.	Milford, N. H.	H. E. Fletcher Co.
Light to medium gray	Fine to medium	Swenson Gray	Concord, N. H.	The John Swenson Granite Co.
Pinkish gray	Medium	Carolina Gray	Salisbury, N. C.	The Harris Granite Quarries Co.
BUFF				
Light grayish buff	Fine to medium	Chelmsford Bulfinch	West Chelmsford, Mass.	H. E. Fletcher Co.
Greenish gray and brown variegated	Medium	Bears Den Quarry	Mason, N. H.	H. E. Fletcher Co.
Light to medium brown	Fine to medium	Swenson Buff Antique	Concord, N. H.	The John Swenson Granite Co.
Brown with dark spots	Medium to coarse	Milford Buff	Milford, Mass.	H. E. Fletcher Co.
PINK				
Lavender pink	Medium	Dunn Mountain	Near Granite Quarry, N. C.	The Harris Granite Quarries Co.
Pinkish, lavender tinted medium gray	Medium or coarse	Goss Pink Deer Isle	Crotch Island, Stonington, Me.	John L. Goss Corp.
Pinkish gray	Medium	Deer Island	Stonington, Me.	Deer Island Granite Corp.
Pink	Medium	Cold Spring Pearl Pink	Cold Spring, Minn.	Cold Spring Granite Co.
Pink	Medium	Pink Milford	Milford, Mass.	S. Haskel & Sons, Inc.
Pink with dark spots	Medium to coarse	Milford Pink	Milford, Mass.	H. E. Fletcher Co.
Light pink with occasional black waves and pink stripes.	Medium to coarse	Swenson Pink	Wells, Me.	The John Swenson Granite Co.
Light pink mottled with large gray and small black spots	Coarse	Conway Pink	Redstone, N. H.	Maine & New Hampshire Granite Corp.
Light mottled pink	Medium, inclined to coarse	Carolina Pink	Near Granite Quarry, N. C.	The Harris Granite Quarries Co.
Light uniform slightly purplish pink	Medium	Balfour Pink	Granite Quarry, N. C.	The Harris Granite Quarries Co.
Pink and black	Fine	Cold Spring Rainbow	Morton, Minn.	Cold Spring Granite Co.
BROWNISH RED				
Brownish red	Medium	Cold Spring Mahogany	Milbank, S. D.	Cold Spring Granite Co.
GREEN				
Dark yellowish greenish gray with black spottings	Coarse	Conway Green	Redstone, N. H.	Maine & New Hampshire Granite Corp.
BLACK				
Black	Medium	Cold Spring Veined Ebony	Mellen, Wis.	Cold Spring Granite Co.
Black	Fine	Cold Spring Black Diamond	Escondido, Calif.	Cold Spring Granite Co.
Black	Fine	Gibraltar Black	Coopersburg, Pa.	S. Haskel & Sons, Inc.

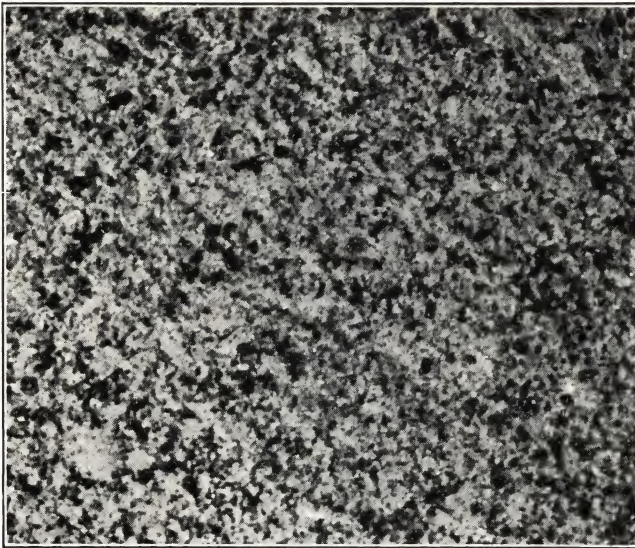
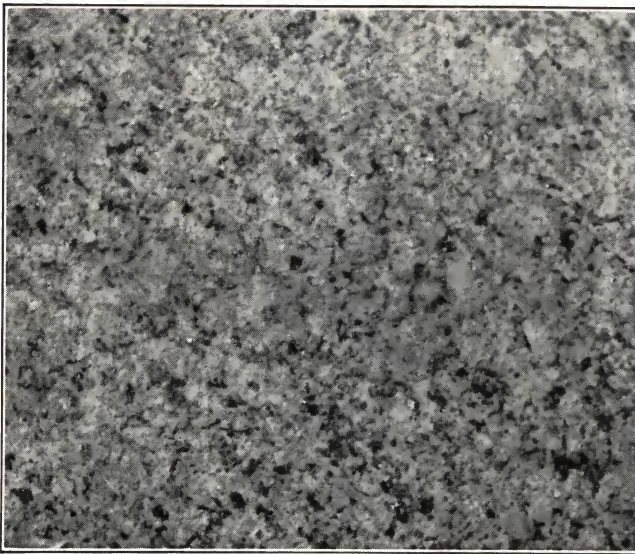
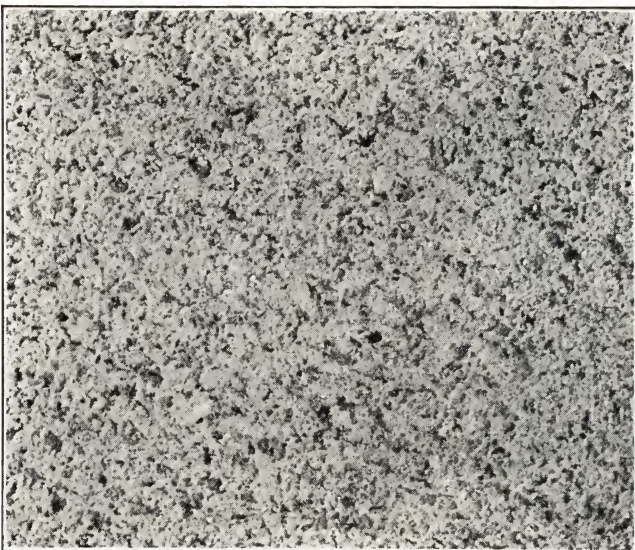
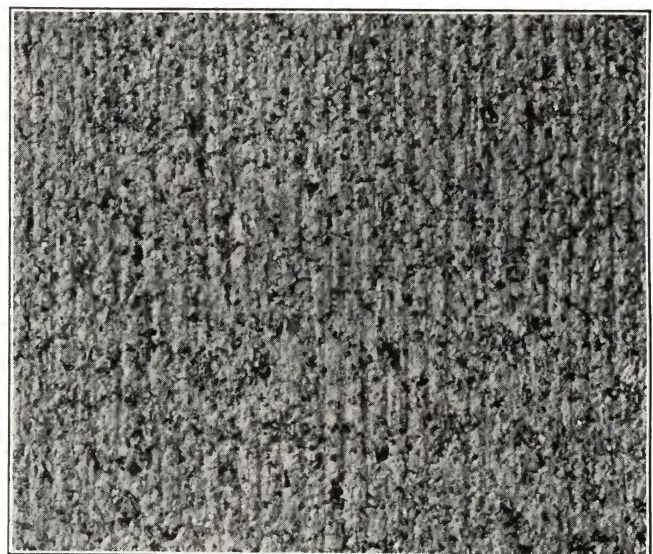
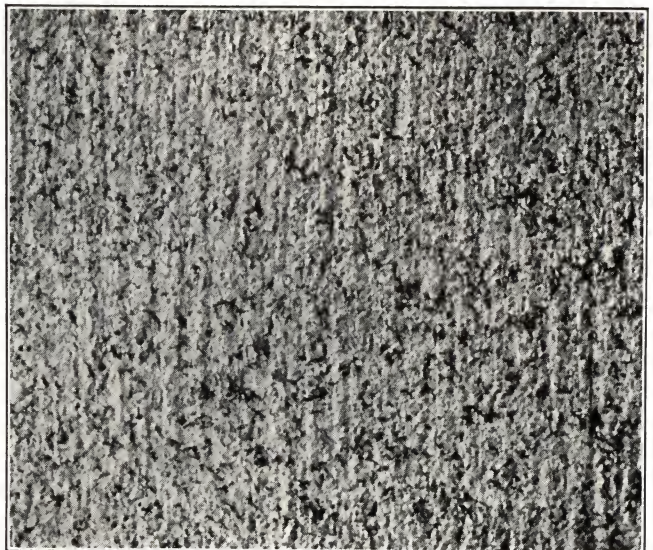
FOR LOCATION OF SAMPLE EXHIBITS SEE BACK COVER

SURFACE FINISHES

For Full Size Reproductions of Standard Building Granite Finishes see Pages 6 and 7

FINISH	CHARACTERISTICS	APPLICATION
POLISHED	Mirror gloss, sharp undistorted reflections. Brings out full crystalline color and pattern Deeper in tone than natural or split face. Keeps clean. Practically impervious to moisture or stain.	For color effects and protection from stain or moisture. Store fronts, Entrance features, Lower stories, Base courses. Thin facing and veneer.
HONED	Dull gloss without reflections. Softer toned than polished but darker toned than split face. Free from scratches. Costs less than polished.	For softer color effects. Otherwise same as polished.
RUBBED	Smooth without gloss—finely sanded effect. Tone approximates split face. Grade—Fine, Medium or Coarse—determined by type and fineness of abrasive used.	Where smooth finish is desired without gloss or marked change in natural tone. Thin facing and veneer.
EIGHT CUT	Fine hammered using eight-cut bush hammer. Lighter in tone than split face. Corrugated by approximately parallel cut marks.	Fine finished work close to eye. Fine molded details. Entrances and window trim.
SIX CUT	Medium hammered using six-cut bush hammer. Similar to 8-cut, but somewhat coarser and less expensive.	General building work. Ashlar and molded features. Medium scale details. Lower stories—4-cut above. Monumental bridge construction.
FOUR CUT	Coarse hammered using four-cut bush hammer. Similar to six-cut, but stronger texture. Least expensive bush hammered finish.	General building work. Lower stories. Upper stories above finer finish. Steps, Curb. Large scale details. Bridge work.
SAWED	Fairly smooth plane surface, similar to hammered in tone. Varied texture— depth and location of saw scoring impractical to control. Subject to rust stain unless cleaned after sawing.	Steps, Platforms, Ashlar. Thin facing and veneer. Upper stories above finer finish. Bridge work.
POINTED	Roughly indented finish with fairly uniform texture. Grade—Fine, Medium or Coarse—determined by size of point used and density of distribution. Coarse pointed is economical finish for large surfaces.	Treads of steps and platforms. Rugged texture effects. Bridge work.
PEEN HAMMERED	Very coarse axed finish, less regular than 4-cut. Roughly levelled with uneven texture. Occasional raw spots and point marks.	Curb, Rough sills and steps. Rough or obscure parts of better grade building work. Rugged texture effects.
ROCK FACE	Split face with edges pitched to approximate plane. Character determined by smoothness, and amount of projection. Least expensive finish for cut granite work. Cost varies with character of face and quality of beds and joints. Freedom from limitation of projection tends to reduce cost.	Bridges. Retaining Walls. Heavy Masonry. Rugged effects.
OTHER FINISHES	Additional finishes, more or less special include: Two-cut; Cross or Random Bushed; Special Pointed; Special Sand, Shot or Abrasive Rubbed.	
ARRISES	Kind of surface finish controls trueness and quality of arris lines.	

FOR LOCATION OF EXHIBITS OF STANDARD FINISHES SEE BACK COVER

**POLISHED****HONED****RUBBED****EIGHT CUT****SIX CUT**

STANDARD

These full size, half tone reproductions show standard grades of surface finish most commonly used on building granite. The illustrations are darker than the actual granite to bring out more clearly the texture of the finish.

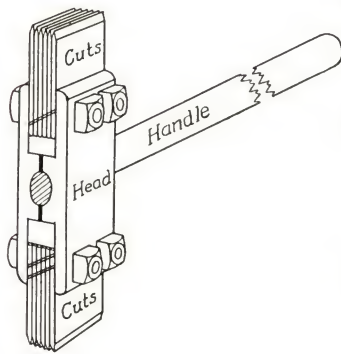
Sawed and Rock Face are not shown, as they cannot be adequately represented in small area.

To clear up a common misunderstanding, full size cross-sections of hand bush hammer cuts (or blades) which produce Eight, Six and Four Cut work, are shown on opposite page. The fallacy of specifying hammered work as so many cuts to the inch is shown by these sections, and by checking the half-tones with a rule.

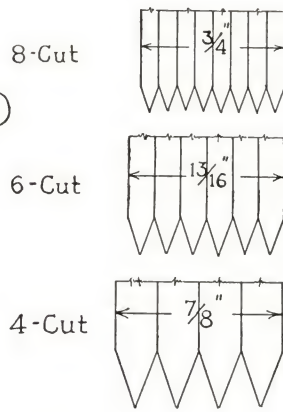
To produce equivalent cut finishes with pneumatic surfacers, the blades are wider spaced.

FINISHES

HAND BUSH HAMMER



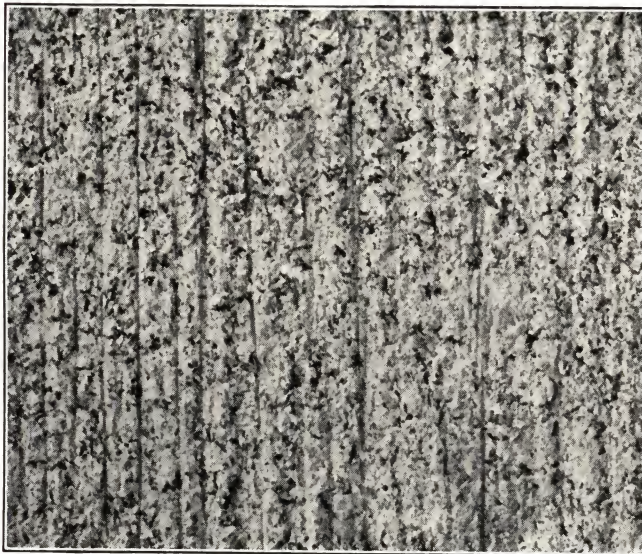
Isometric View



F. S. Sections of Cuts



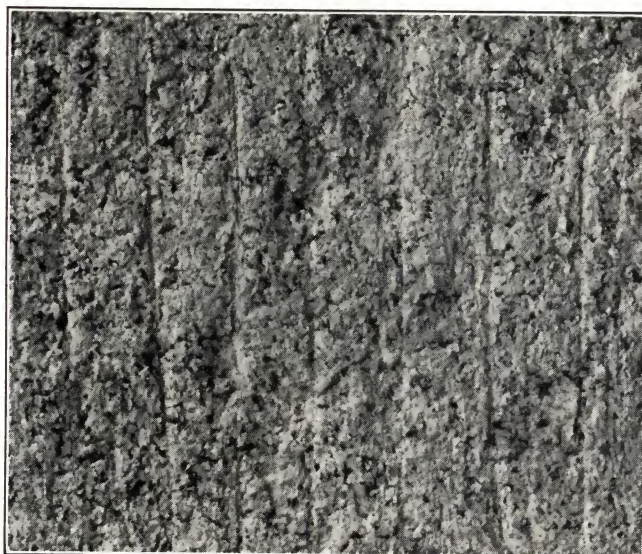
FINE POINTED



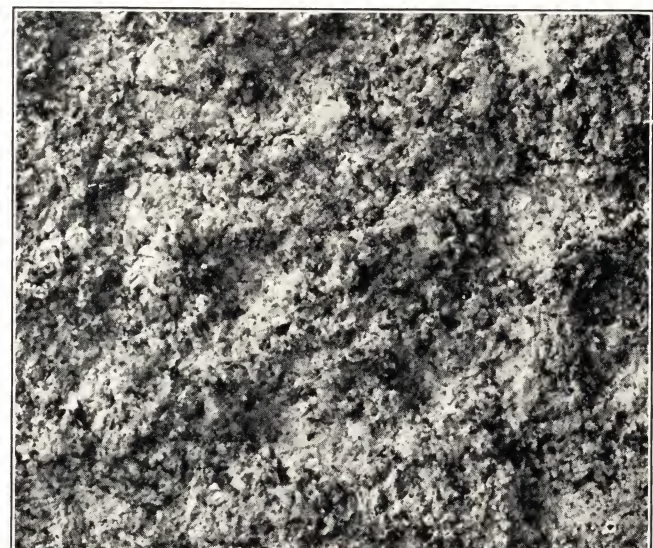
FOUR CUT



MEDIUM POINTED



PEEN HAMMERED



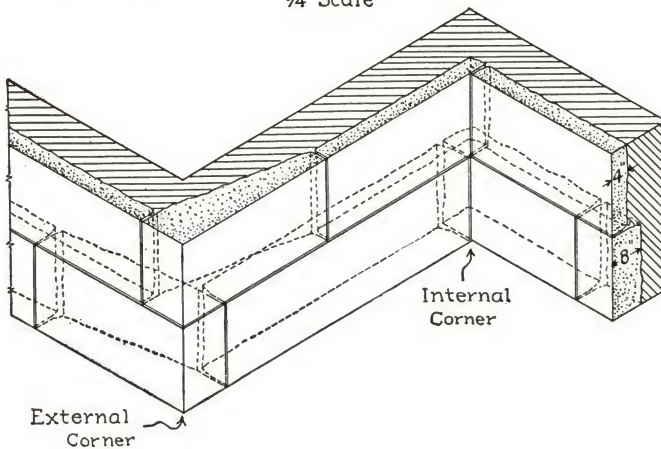
COARSE POINTED

DETAILING

STANDARD GRANITE WORK Bonded Construction

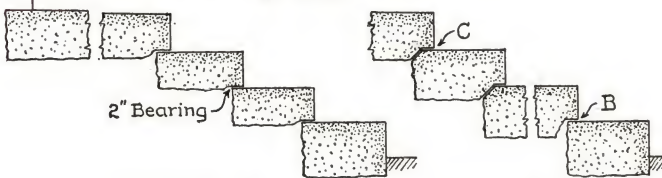
DETAILS SHOWING BONDING OF CORNERS

1/4" Scale



SECTIONS SHOWING BEARINGS FOR STEPS

3/8" Scale



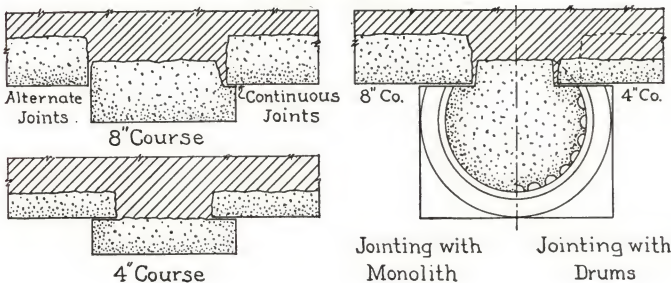
SECTION A

SECTION B & C

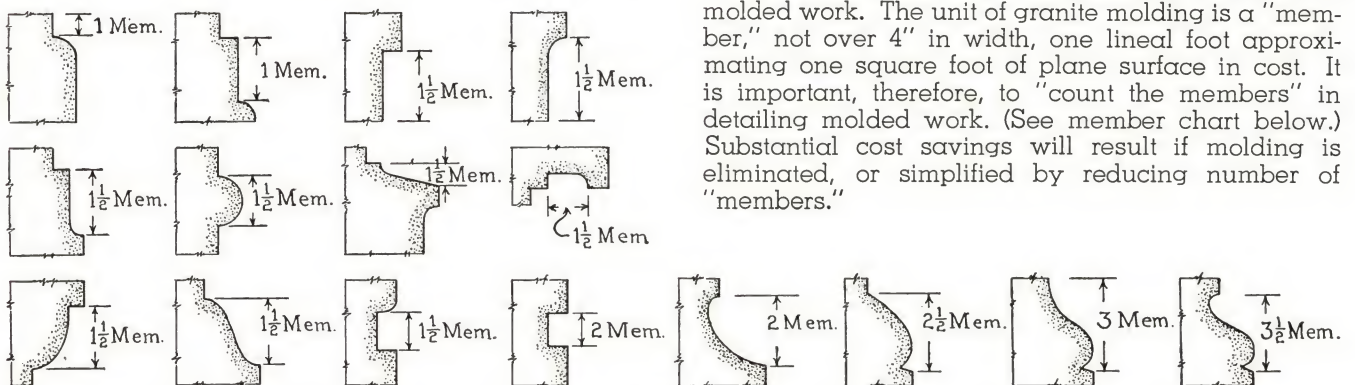
NOTE - For wide flights bearings shown at B or C are used to prevent sliding. B is practical and less expensive than C.

BONDING OF PILASTERS & COLUMNS

3/8" Scale Plans



GRANITE MOLDINGS - BASIC MEMBER COUNTS



For best results and maximum economy detail specifically for granite, not for stone. Methods, tools and machines for processing granite are quite different than for other stones, with different limitations and cost effects.

WALL ASHLAR

Reduce thickness to minimum consistent with type of finish and structural requirements.

Rock face—make minimum thickness one-third rise.

Hammered finishes—Minimum thickness 3" or 4".
Sawed, Rubbed or Polished—ordinary minimum 2".

Make ashlar faces of large area for economy.

Keep heads within ashlar thickness if possible.

Eliminate internal angles cut in the solid.

Avoid checking for steel or concrete by jointing, or reducing thickness of facing.

STEPS AND PLATFORMS

Avoid raised seats or lugs—Keep to flat surfaces to permit sawing.

Set steps and platforms to pitch 1/8" to foot.

Keep concrete 2" low to avoid unnecessary bedding of granite.

Specify 4-cut, pointed or shot-rubbed treads or sawed for less expensive construction.

PILASTERS AND COLUMNS

Large monoliths cost more than if jointed.

Flutes add substantially to cost.

Alternate joints cost less than continuous.

MISCELLANEOUS DETAILS

Raised panels cost less than sunk panels.

Flat top coping costs less than apex or saddle-top.

Permit optional false jointing of jambs or flat arches, and of molded courses having facias or flats 4" or wider.

Avoid projections in courses which might otherwise be sawed, by jointing or eliminating projections.

Detail drips to be abrasive sawed.

GRANITE MOLDINGS

Expensive hand labor is generally involved in molded work. The unit of granite molding is a "member," not over 4" in width, one lined foot approximating one square foot of plane surface in cost. It is important, therefore, to "count the members" in detailing molded work. (See member chart below.) Substantial cost savings will result if molding is eliminated, or simplified by reducing number of "members."

FOR GRANITE

GRANITE VENEER

Machine Processed Work

Moderate cost and superior architectural qualities have stimulated wide use of machine processed granite as exterior facing for modern fronts, remodeling work and light construction.

Granite veneer is produced from sawed slabs with machine polished, honed, rubbed, sawed, or special sand, shot or abrasive treatments, and abrasive sawed joints. Effective decoration may be added at moderate cost in the form of sub-surface ornament, abrasive sawed or sand blasted.

This type of granite work has little in common with the time-honored forms and precedents of dressed granite masonry, either as to structural or design requirements. It is attached to the steel work or supporting structure as a protective and decorative veneer, the type of ties and anchoring depending on the character of the supporting structure.

THICKNESS AND TOLERANCES

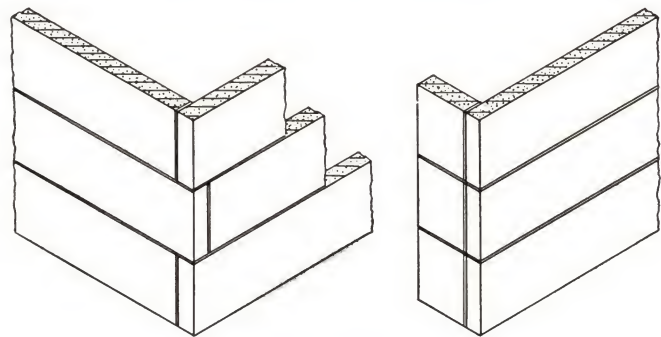
Granite facing from 4" to 1" in thickness may be utilized with a recommended practical tolerance in thickness of $\pm \frac{1}{2}$ " for slabs 2" or over and $\pm \frac{1}{4}$ " for slabs under 2" thick. Surface areas up to the limits of the average gang saw (see page 10) are available to the designer.

ABRASIVE SAWED JOINTS

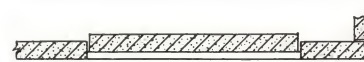
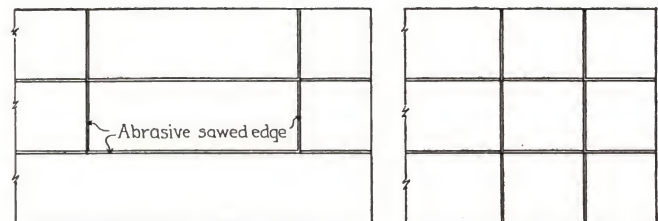
Abrasive sawed beds and joints will bond as effectively with setting or pointing mortar as ordinary chiselled or pointed joints. It is not necessary to remove or roughen the semi-glaze left by the abrasive saw, and adds needless expense.

Accompanying sketches illustrate typical features and applications, and indicate something of the scope and possibilities which machine processed granite offers to modern designers.

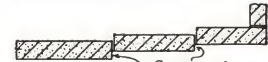
DETAILS AND APPLICATIONS



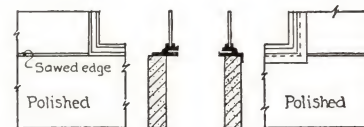
Jointing at Corners and Deep Reveals



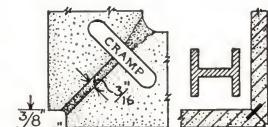
Panel Jointing



Vertical Set Backs

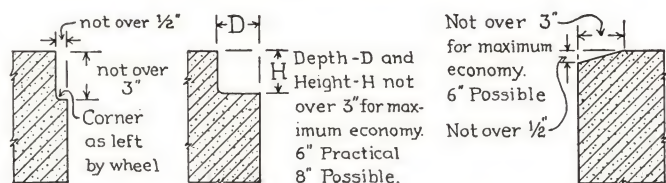


Show Window Trim



Quirk Joint

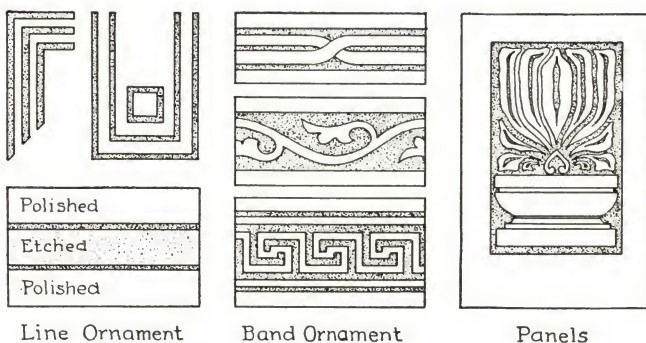
ABRASIVE SAWED CHECKS AND CHAMFERS



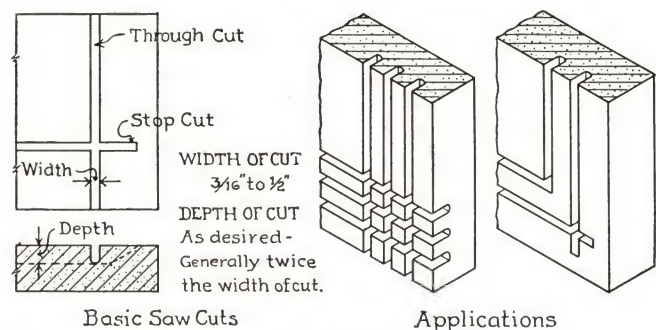
Sawed Checks

Sawed Chamfers

SAND BLASTED ORNAMENT



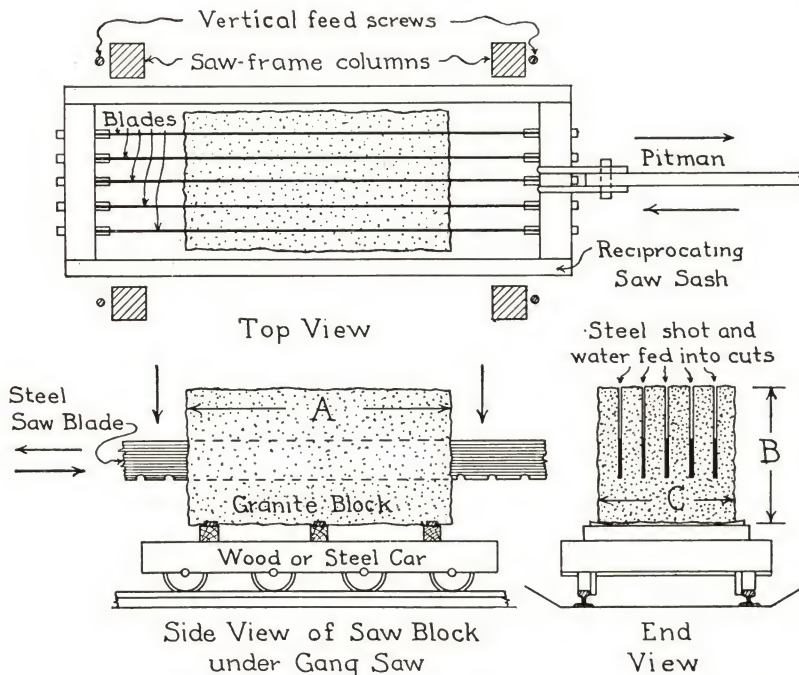
ABRASIVE SAWED ORNAMENT



PROCESSING

Present day developments in processing granite have opened up entirely new possibilities in form, finish and application. The basic principles of some

THE GRANITE GANG SAW



THICKNESS OF SLABS

- 4"—Ordinary Minimum
- 2"—Practical Minimum
- 1"—Special

THICKNESS OF CUT OR SAW KERF

- Small Saws— $\frac{5}{8}$ "
- Average Saws— $\frac{3}{4}$ "
- Large Saws— $\frac{7}{8}$ " to $1\frac{1}{8}$ "

COST

Three to seven blades most economical for average sawing. Ordinarily no additional saving for slabs under 3" or 4" thick. Veneer under 2" thick will ordinarily cost more per sq. ft. than 4" work.

MAXIMUM SAW BLOCK SIZES

- Small Gang Saws
- Average Gang Saws
- Special Gang Saws
- Rotary Saws

LENGTH—A

- 10 ft.
- 12 or 14 ft.
- 14 to 18 ft.
- No limit

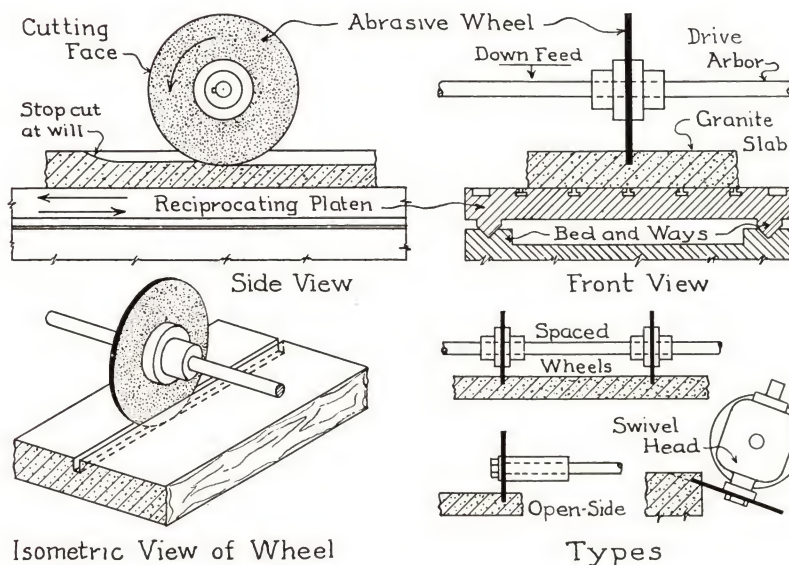
HEIGHT—B

- 5 ft.
- 6 or 7 ft.
- 6 to 14 ft.
- $3\frac{1}{2}$ to 5 ft.

WIDTH—C

- 5 ft.
- 6 ft.
-
-

THE ABRASIVE SAW—EDGING AND COPING MACHINE



DATA

Wheel sizes up to 30" in diameter. Thickness of wheel and cuts— $\frac{3}{16}$ " to $\frac{1}{2}$ ". Depth of cut—3" practical, up to 9" possible. Special wheels for flats, washes and molded forms up to 6" wide.

APPLICATION

- Edging and jointing.
- Small heads and chamfers.
- Checks, rabbets and drips.
- Small moldings and line ornament.

INFORMATION

of the more important processes now utilized are briefly outlined here as a matter of information and possible aid to the designer and specification writer.

THE SAND BLAST PROCESS

The cutting medium is white silica sand or other abrasive, driven at high velocity through a hand controlled nozzle. For ornament or lettering the face is covered with a rubber-like blanket in which a stencil of the design is cut out, leaving only those parts of the granite exposed which are to be etched.

APPLICATION

- 1—Cleaning and finishing sawed surfaces.
- 2—Relieving carving and projections, and for perforated work.
- 3—Etching surface ornament, low relief carving, and lettering.

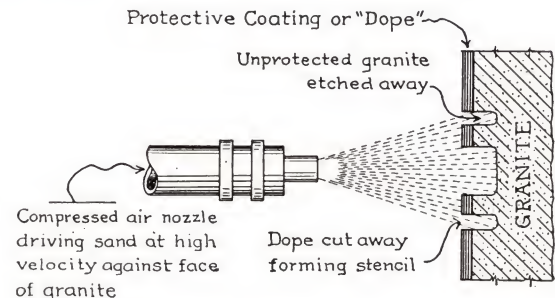


Diagram Showing Principle of Sand Blasting Process

MACHINE POLISHING

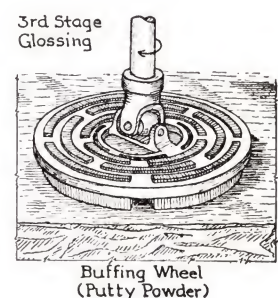
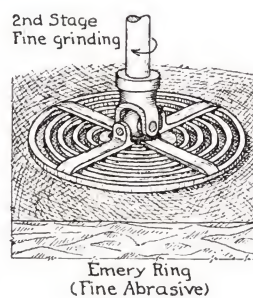
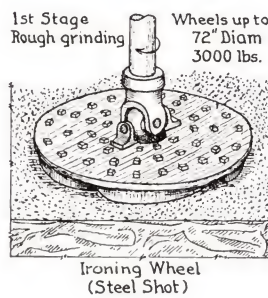
APPLICATION

For rubbing, honing and polishing sawed or roughly levelled surfaces.

Plane surfaces without projection.

Plane surfaces below a projection (as a nosing), if clear of projections on three sides.

Small surfaces, using small hand-controlled machines.

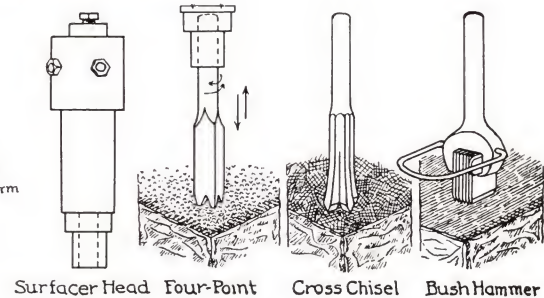
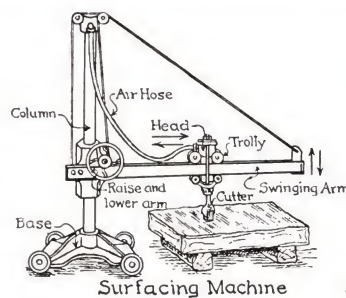


PNEUMATIC SURFACING MACHINES

APPLICATION

Roughing, pointing and bushing plane or flatly curved surfaces.

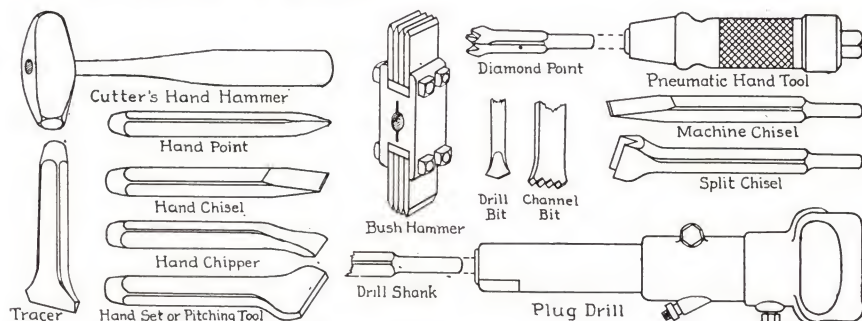
For finishing practically every bush-hammered surface of any considerable area, from the rough or sawed.



HAND CUTTING TOOLS

APPLICATION

Hand work is required where a sawed surface cannot be utilized, or an edge or sinkage produced by sawing. This applies generally to molded work, surfaces below a projection, heads, internal angles, beds and joints unless sawed, and practically all irregular pattern stones.



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NATIONAL BUILDING GRANITE QUARRIES ASS'N, INC.

5619 Grand Central Terminal Building

Telephone Murray Hill 9-2465

NEW YORK

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